

Beaver Valley East Landfill Evaluation

PREPARED FOR: David Guier, LyondellBasell
Jane Patarcity, Beazer East, Inc.

PREPARED BY: Cheri Salas, CH2M HILL

COPIES: Jim Meier, CH2M HILL

DATE: September 2, 2008

PROJECT NUMBER: 365166

Project Background

On August 22, 2007, during a field visit, the PA Department of Environmental Protection (PADEP) observed an area devoid of any significant vegetation within the East Landfill area. PADEP also observed an eroded embankment which had taken down a section of the site fence. Following the field observation, the PADEP issued a Notice of Violation (NOV) to LyondellBasell for this area (Attachment A). At LyondellBasell's request, CH2M HILL conducted a brief site visit in October 2007 to document site conditions so that LyondellBasell could understand the NOV and assess an appropriate response.

Based on the results of the initial site visit, LyondellBasell requested that CH2M HILL:

- Determine if the area devoid of significant vegetation is within LyondellBasell's property but outside of the landfill waste footprint, and evaluate whether revegetation is required
- Conduct further evaluation to confirm and document that the eroded embankment is not impacting the landfill
- Develop preliminary cost estimates for alternatives to relocate and repair the fence

This technical memorandum documents the results of this evaluation.

Existing Site Conditions

CH2M HILL staff conducted a site visit on June 25, 2008, to confirm and document that the eroded embankment is not impacting the East Landfill. Figure 1 provides an annotated aerial photo that illustrates the extent and location of the eroded embankment, the security fence failure, and the area of sparse vegetation relative to the East Landfill. It is assumed the East Landfill cap extends to the top of the slope. The only known waste areas are the phosphate sludge dewatering pits, shown in Figure 1. The locations of these pits were digitized from a site map provided by LyondellBasell during the initial site visit in October 2007 (Attachment B).

Based on field observations, the eroded embankment is located approximately 150 feet from the estimated limit of the cap, and approximately 230 feet from the closest known disposal area.

Eroded Embankment

A stable stream channel typically consists of a defined bankfull channel that carries flows up to approximately a 1.5-year return period storm event. Higher flows spread out across a floodplain. One mode of channel destabilization involves downcutting (i.e. lowering of the channel bed by excess shear stress acting on the bed) followed by widening (i.e. erosion of channel banks by excess shear stress after a resistant layer in the channel bed has been reached), as the channel adjusts to altered hydrology, geometry, gradient, or some combination of these factors (Schumm, et al., 1984). In this way, a new bankfull channel and floodplain is often created below the elevation of the original floodplain. The original floodplain is then referred to as a terrace.

Based on site observations, the channel adjacent to the East Landfill is not stable. It appears to have cut down creating a terrace (cutwall) 4-feet above the thalweg (lowest point in the channel) and has begun to widen to create a new floodplain (Photo 1). Concrete channel stabilization upstream and downstream of the site is being undermined (Photos 2 and 3), confirming the active down cutting of the channel. This stabilization is located outside the security fence, on the opposite side of the stream channel, and based on discussions with Lyondell, it is believed to be on the adjacent property. A brief watershed analysis is provided in Attachment C.

The embankment of concern is a land slope that has been eroded as the channel has eroded through the terrace. It is located approximately 25 feet from the bankfull channel. At the highest point, the eroded slope is approximately 30 feet high and consists of loose sand and gravel. During the site visit, the embankment was extremely dry, with cohesionless soils. Figure 2 provides a cross section of the most extreme point of erosion. The erosion scar extends approximately 100 feet (longitudinally along the embankment) to the points where it intersects the 4-foot terrace on both the upstream and downstream sides. The terrace also shows signs of erosion (Photo 4), indicating the channel may still be widening. The erosion has created a 75-foot gap in the security fence on the top of the terrace. Photos of the existing conditions of the channel are provided in Attachment D.

Current site conditions indicate that the cause of the erosion is undercutting of the toe during flood flows involving overbank flow conditions. The stream channel is located in a valley, approximately 30-feet below the toe of the East Landfill. There is a series of dewatering ponds on the adjacent property (Figure 1) that appear to have been constructed in the stream valley, within the former floodplain of the channel. Based on the USGS Topographic Quad Map, the ponds have been in existence since at least 1983. The exact date of installation for these ponds could not be determined from available data. The steep slope from the LyondellBasell property and the dewatering ponds appear to have created a pinch point (i.e. a constrictive narrowing) in the floodplain. As high flows approach the area adjacent to the eroded embankment, the flow width narrows, and flow depth and velocity increase. At this location, the flow velocities are directed toward the eroding embankment as it turns to flow into the straightened segment. The sheer stresses resulting from the higher flow velocities and flow redirection appear to have caused the eroding embankment. Additionally, the berms from the ponds were likely constructed of compactable material that would prevent erosion, placing higher pressure on the more erodible embankment on the property.

The timing of the embankment erosion is difficult to determine, however it appears to have begun some time between 1993 and 2006 based on available aerial images. The aerial images obtained for the site map are referenced as being taken between 2003 and 2006. These images show the embankment erosion, in a similar location to what was observed in the field and can be observed in recent Google Map™ images. Images from 1993 (www.terraserver-usa.com) do not show the embankment erosion.



PHOTO 1
Typical Channel Cross Section



PHOTO 2

Channel undermining concrete stabilization upstream of site, adjacent to the dewatering ponds



PHOTO 3

Channel undermining rock downstream of site, on adjacent property

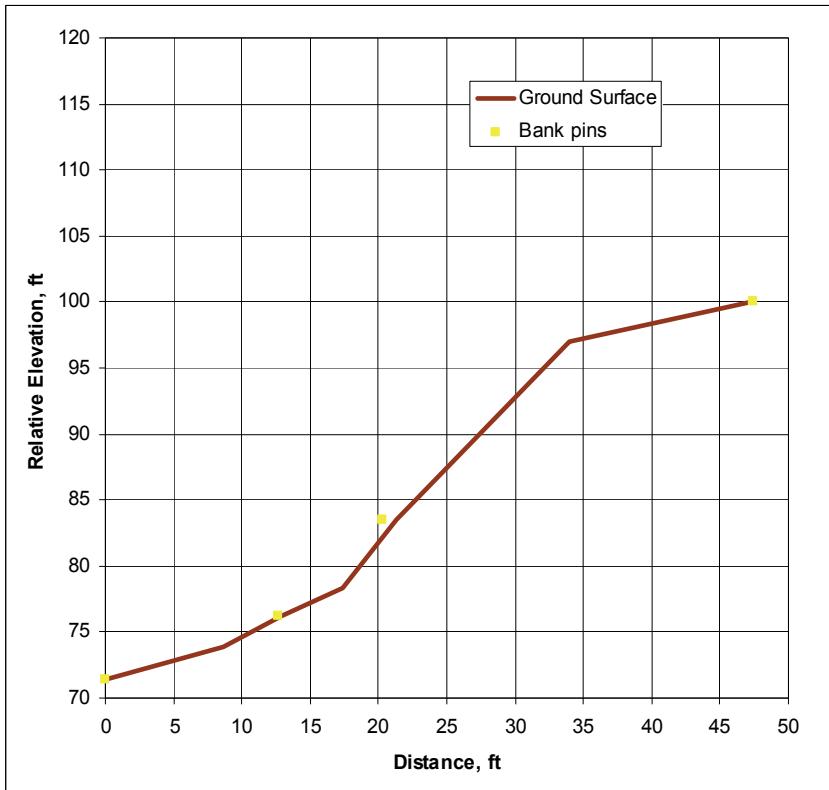


FIGURE 2
Eroded Embankment Profile



PHOTO 4
4-foot terrace upstream of site

Monitoring Site Description

During the site visit, a basic channel stability monitoring site was installed at the location of the surveyed cross section. The monitoring site included the following components:

- A profile of the embankment was surveyed as a baseline that can be compared to future surveys to quantify the progression of erosion. The survey was conducted with a laser level to obtain height changes from an arbitrary datum (Top of bank control Pin = EL 100). Because of the height and slope of the embankment, level horizontal measurements were difficult. Horizontal measurements were taken along the slope and adjusted to account for the slope angle. Although this is not a survey-grade bank profile, the measurements should provide sufficient accuracy to monitor significant embankment erosion.
- Survey control pins (2-foot lengths of steel rebar) were set at the top of the slope and at the toe of the slope. These pins can be used to resurvey the same cross section to quantify the rate of erosion within the embankment. These pins were marked with orange survey flagging to facilitate relocation.
- Two bank pins (4-foot rebar hammered into the bank until refusal) were set in the embankment. These can be used for a quick visual observation. If the embankment continues to erode, the pins will become exposed over time. Hand measurements of the length of pin exposed can be used to estimate the rate of erosion.

Details on the monitoring site are provided in Attachment E.

Area of Sparse Vegetation

During the site visit, the area of sparse vegetation was evaluated for limiting factors (i.e., soil nutrient content and soil physical condition) that could result in the lack of vegetation. The area was sparsely vegetated with grass (*Poaceae* sp.), and was dominated by a dense covering of moss (*Bryophyta* sp.) (Photos 5 and 6). The site is vegetated by few trees or shrubs, although adjacent areas are forested at what visually appears to be a natural density. Red maple (*Acer rubrum*) seedlings were observed within the adjacent forested areas but were not observed within the sparsely vegetated study area.



PHOTO 5
Sparsely vegetated area



PHOTO 6
Moss observed in sparsely vegetated area

The predominant vegetation species in the adjacent areas include red maple, black walnut (*Juglans nigra*), black cherry (*Prunus serotina*), American elm (*Ulmus Americana*), hornbeam (*Carpinus caroliniana*), honey locust (*Gleditsia triacanthos*), apple (*Malus sp.*), Virginia pine (*Pinus virginiana*), silver maple (*Acer saccharinum*), fringe tree (*Chionanthus virginicus*), eastern poison ivy (*Toxicodendron radicans*), deer-tongue grass (*Panicum clandestinum*), common nettle (*Urtica sp.*), and bleeding heart (*Dicentra eximia*).

Soil samples were collected in both the area of sparse vegetation, and the adjacent forested area, and analyzed by A&L Eastern Laboratories, Inc. for macronutrients (phosphorus, potassium, magnesium, calcium, sulfur, zinc, manganese, iron, copper, boron, sodium, soluble salts, aluminum, chloride, nitrate, organic matter, pH, acidity, and percent base saturation) and particle size distribution to evaluate soil fertility. The results of the soils analyses are summarized in Table 1 and provided in Attachment F. The soil results do not indicate that poor soil fertility is the cause of the sparse vegetation. Soil results from the adjacent forested areas display similar soil macronutrient levels. The soils were visually inspected during sample collection for indications of localized compaction. The soil examined within the sparsely vegetated study area displayed no compaction and were similar in compaction to the adjacent forested areas. Differences in soil texture, color, and moisture content were observed between the study area and the adjacent forested soils during sampling. The study area soils were dry; light brown and gritty in texture, while the forested soil was moist, dark brown to black and contained high levels of leaf litter. This difference is related to higher organic matter content of the soil from the forested area and shaded conditions resulting in increased soil moisture.

The results of this evaluation do not provide a conclusion as to the cause of the sparse vegetation. Based upon field observations and available disposal area information, the area with sparse vegetation is located approximately 150 feet from the estimated limit of the landfill cap, and over 200 feet from the closest known disposal area. Our understanding is that the landfill was capped and vegetated over 20 years ago providing for sufficient time for natural vegetation to recolonize in the area. The absence of vegetative growth in this area cannot be explained without gathering additional data on soil conditions and potential vegetative stressors.

TABLE 1
Results of Soils Analyses

Parameter	Units	Forested	Non-vegetated
P	ppm	155	107
K	ppm	52	90
Mg	ppm	80	80
Ca	ppm	960	550
S	ppm	21	18
Zn	ppm	999	999
Mn	ppm	80	82
Fe	ppm	57	53

TABLE 1
Results of Soils Analyses

Parameter	Units	Forested	Non-vegetated
Cu	ppm	18.8	18.3
B	ppm	0.5	0.4
Na	ppm	14	21
pH	units	5.6	6
Organic Matter	Percent	8.8	6.3
Soil Texture			
Percent larger than Sand		49.62	36.7
Soils Classification		Sandy Loam	Sandy Loam
Sand	Percent	60	64
Silt	Percent	28	26
Clay	Percent	12	10

ppm = parts per million

Evaluation of Potential Erosion Threat to East Landfill

Based on the visually-observed site conditions and information we have to date, the embankment displays active surface erosion and the creek continues to erode soil material at the base of the slope, which could maintain the slope in its erosive condition. That said, the physical dimensions of the slope and the distance of the creek from the East Landfill waste boundary (as specified in the drawings and sketches provided for this evaluation) suggest that this erosion does not constitute an imminent threat to the landfill. Periodic monitoring of these site conditions and inspection of the slope, for any acceleration of erosion or soil is suggested.

If additional erosion does occur, the toe of the slope could be stabilized with rock of sufficient size / gradation, or other optional materials to arrest the erosion, and the upper embankment can be revegetated. Consideration should be given to the potential consequential impact to adjacent portions of the embankment to prevent the erosion from migrating further downstream after stabilization.

Revegetating the area at the top of the slope will provide only limited protection to the landfill because the slope appears to be failing from the toe. If further erosion occurs, the root systems from vegetation are too shallow to prevent the mass-wasting that results from toe erosion on this steep of a slope.

Proposed Actions

Based on the site observations, the following actions are recommended:

- 1) Replace the security fence. This will require rerouting the fence up to the top of the slope and across the unvegetated area. A new fence alignment is proposed in Figure 1. This will require installation of approximately 400 feet of fence. The estimated fence replacement costs are \$14,000–\$30,000. Cost estimation details are provided in Attachment G.
- 2) Monitor the erosion area annually to confirm the erosion is not threatening the landfill. Use the monitoring site that was installed during the site visit.
- 3) No action is proposed for the sparsely vegetated area because it is outside the limits of the East Landfill.

References

Schumm, S.A., M.D. Harvey and C.C. Watson, 1984. *Incised Channels: Morphology, Dynamics, and Control*. Water Resources Publications, Littleton, Colorado.

Westergard, B.E., Mulvihill, C.I., Ernst, A.G., and Baldigo, B.P., 2005, Regionalized Equations for Bankfull-Discharge and Channel Characteristics of Streams in New York State: Hydrologic Region 5 in Central New York: U.S. Geological Survey Scientific Investigations Report 2004-5247, 16 p., online only.



Legend

▲ Fence Gate	— Bank Profile
■■■■ Approximate Limits of CAP	— Eroded Embankment
— Contours 10ft interval	— Former Phosphate Sludge Dewatering Pits
— 16' Wide Lowflow Channel	— Vegetated Slope
— Pipe Undercut Rock Footing	— Floodplain Terrace
— Security Fence	— Sparse Vegetation
— Proposed Relocation Security Fence	— 4' Eroded Bank
— Undercut Concrete Bank	

Elevation Contours derived from USGS Digital Elevation Model
Aerial Imagery provided by PAMAP Program, PA Department of Conservation and Natural Resources and the Bureau of Topographic and Geologic Survey, 2006

N
0 50 100
Feet
1 inch equals 50 feet

Figure 1
Site Map with Field Notes
LyondellBasell Beaver Valley East Landfill

Attachment A

PA DEP Notice of Violation



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WASTE MANAGEMENT – SOUTHWEST REGION

Insp ID: 105 2363
Client ID: 202 630
Enf ID: 225 672

NOTICE OF VIOLATION

Date of Inspection: 08/22/2007

Municipality: Potter Twp.

Inspector: Paul J Minor

County: Beaver

Company Name: Lyondell Chemical

ID No: Client ID 202630

Address: One Huston Center
1221 McKinney St.

Phone: 713.309.7794

City, State, Zip: Houston TX 77010

Responsible Official: David R Guier

Title: Mgr. Retain Liabilities

Person Interviewed: David R. Guier

Title: Mgr. Retain Liabilities

Notice to facility operator:

Attached to this Notice of Violation is a report of an inspection of your facility. It is important that you carefully read the report and respond as requested. The report notes conditions that are violations of the Department's rules and regulations and the Solid Waste Management Act, the Act of July 7, 1980, P.L. 380, as amended, 35 P.S. §§ 6018.101—6018.1003 ("SWMA"). The report may also note conditions that may contribute to or develop into violations of the regulations and/or the SWMA and therefore should be addressed.

This Notice of Violation is neither an order nor any other final action of the Department. It neither imposes nor waives any enforcement action available to the Department under any of its statutes. If the Department determines that an enforcement action is appropriate, you will be notified of the action.

Signature by the person interviewed does not necessarily imply concurrence with this Notice of Violation or the attached inspection report, but does acknowledge that the person was shown the report or that a copy was left with that person.

Person Interviewed (signature): Mailed

Date: 9/21/2007

Inspector (signature)

Date: 9/21/07

ATTACHMENT: Inspection Report

REG/FJD/LYONDELL/BEAVER/HNOVA/SPADEZI/TWP
[Handwritten signatures and initials over the bottom line]

Department of Environmental Protection		GENERAL INSPECTION REPORT		Bureau of Land Recycling and Waste Management
Type of Inspection Routine	WM Identification Number Client ID 202630	Entry Time/Date 10:00 8/22/07	Exit Time/Date 12:30 8/22/07	
Facility/Incident Name and Location Lyondell/Beazer Racoon Creek Site		Municipality Potter Township		
		County Beaver		
Name, Address or Responsible Official David R. Guier		Title Manager of Retained Liabilities & Remediation Programs		
Michael D Tischuk, Environmental Mgr. Beazer Jane Patarcity, Mgr. Env & Tech Services Tom Duplesis		Telephone 713-309-7794	Interviewed? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	

REMARKS

I was onsite with Mr. Dave Leiford and Mr. Carl Spadero from the department for an inspection of the closed Lyondell/Beazer Raccoon Creek Site adjacent to the NOVA Chemicals facility in Monaca, Beaver County, PA. Jane Patarcity and Michael Tischuk were present representing Beazer and David Guier representing Lyondell. Mr. Tom DuPlessis was representing NOVA Chemicals.

Our purpose was to inspect the condition of the capped Raccoon Creek Disposal Area. Access to the site is controlled by NOVA Chemicals through a gate adjacent to BASF on the east side of Raccoon Creek. The capped landfills are subject to a 1997 COA with DEP.

We 1st inspected the eastern end adjacent to the Cinergy Generation Plant/ Horsehead Corporation facility. Our inspection revealed an area with no vegetation the eastern side of the site leading down to a tributary stream. The area of no vegetation extended from the top of the capped disposal area down to the fence. This area is characterized by moss and dead and dying trees.

Mr. Leiford noted damage done to the perimeter fence and significant erosion. The stream has recently eroded into the bank and taken down a large section of the sites fence. Photographs were taken of this area. One monitoring well marked EL #7 in this area was stuffed with rags and had no padlock. It was unclear if this was an active monitoring well. The department suggests that Lyondell take steps to repair the fence and take steps to prevent the stream from eroding into the site.

Vegetation on top of capped area was adequate. It was covered by grass and patches of woody vegetation. No exposed waste was observed

We traveled to the area adjacent to Raccoon Creek. Wash outs on the road from recent rains prevented vehicle access. Visibility was limited in this area do to a thick growth of invasive Polygonum cuspidatum Sieb. & Zucc., common name Japanese Knot weed. The condition of this side of the site could not be accurately examined. Mr. Spadero recommended a fall inspection after a killing frost removed the Knot Weed. We wanted to see if the exposed areas of ash were capped after the October 9, 2003 inspection.

The western disposal south west of the NOVA site was in good condition. The vegetation was covering the entire area. No exposed waste or discharges were observed.

Violations:

The area cited in the inspection report is devoid of any significant vegetation therefore Lyondell Chemical is in violation of Section 610(9) of the Solid Waste Management Act/ Lyondell has failed to meet the requirements of the 1997 COA. The violations should be corrected by December 31, 2007.

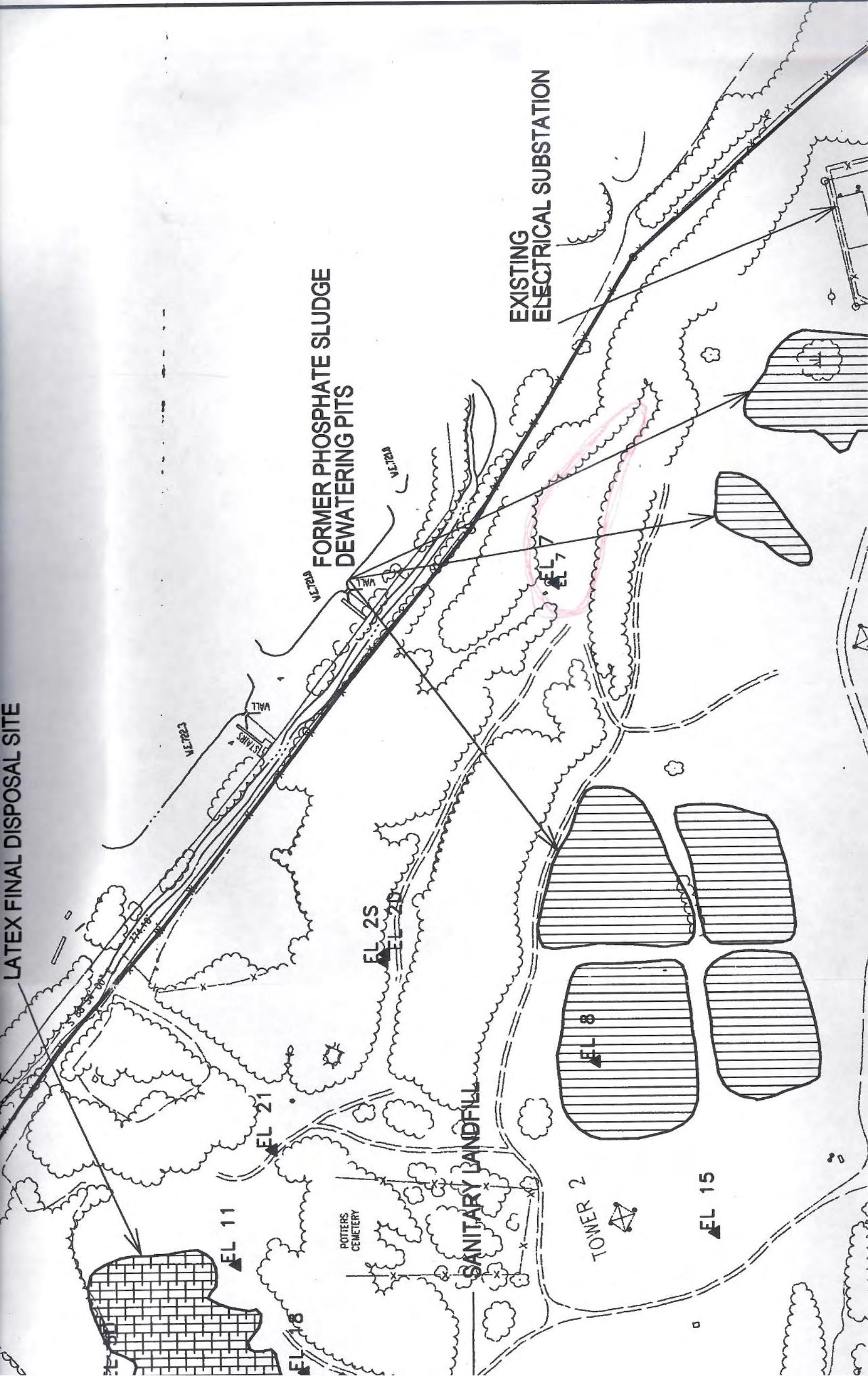
END

Sample Collected? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Sample Numbers N/A	Analysis N/A	
Inspector Name Paul J Minor Solid Waste Specialist	Inspector Signature 	Headquarters SW Regional Office 400 Waterfront Dr. Pittsburgh, PA 15222	Date 9/4/07 Telephone (412) 442-4121 (412) 442-4194 FAX

Person Interviewed Name N/A	Signature of Person Interviewed Mailed to David R. Guier, Lyondell	Title Manager of Retained Liabilities & Remediation Programs	Date 09/04/2007 Telephone
<p>This document is official notification that a representative of the Department of Environmental Protection inspected the above-mentioned facility. The findings of the inspection are shown above and on any attached pages. Violations discovered as a result of this inspection are indicated. Violations may also be discovered upon examination of the results of laboratory analyses, review of pertinent documents and further investigation. Notification will be forthcoming if such violations are discovered.</p>			

Attachment B
Original Map of Waste Disposal Areas

LATEX FINAL DISPOSAL SITE



Attachment C Watershed Characteristics

Based on USGS topographic contours of the watershed the stream channel has a drainage area of approximately 1.7 square miles (1100 acres) (Figure C-1). Based on engineering judgment and site observations, the channel is an intermittent channel, confirmed by the absence of water in the channel during the site visit. The Beaver Valley site is located in Beaver County, within the Appalachian Plateaus physiographic region, therefore CH2M HILL obtained regional curves for bankfull flow and channel dimensions for the Appalachian Plateau, published by USGS (Westergard, et al., 2005). Table C-1 reports the regional curve equations and the estimated bankfull dimensions of the stream channel adjacent to the East Landfill. Based on field measurements, the bankfull channel is approximately 16 feet wide and 1 foot deep, aligning well with the regional curve computations.

TABLE C-1
Bankfull Dimensions based on Regional Curves

Parameter	Regional Equation	Computed Dimension for Beaver Valley Channel
Bankfull Discharge, cfs	$45.3 * DA^{0.856}$	69
Bankfull Cross-sectional area, sq ft	$10.8 * DA^{0.823}$	17.2
Mean Bankfull Depth, ft	$13.5 * DA^{0.449}$	1.0
Bankfull Width, ft	$0.801 * DA^{0.373}$	16.9

DA = Drainage Area, sq mi



Figure C-1
Watershed Map
LyondellBasell Beaver Valley East Landfill

Attachment D Site Photos from Field Visit



Unvegetated area, looking west



Unvegetated area, looking west



Access to unvegetated area, looking west



Unvegetated area, looking east



Terrace below unvegetated area



Unvegetated area looking west



Forested slope adjacent to unvegetated area



Close-up of soils and moss cover in unvegetated area



Unvegetated area looking west



Forested slope adjacent to unvegetated area



Concrete stabilized stream bank, upstream of site, looking downstream



Eroded terrace slope, upstream of site, looking downstream



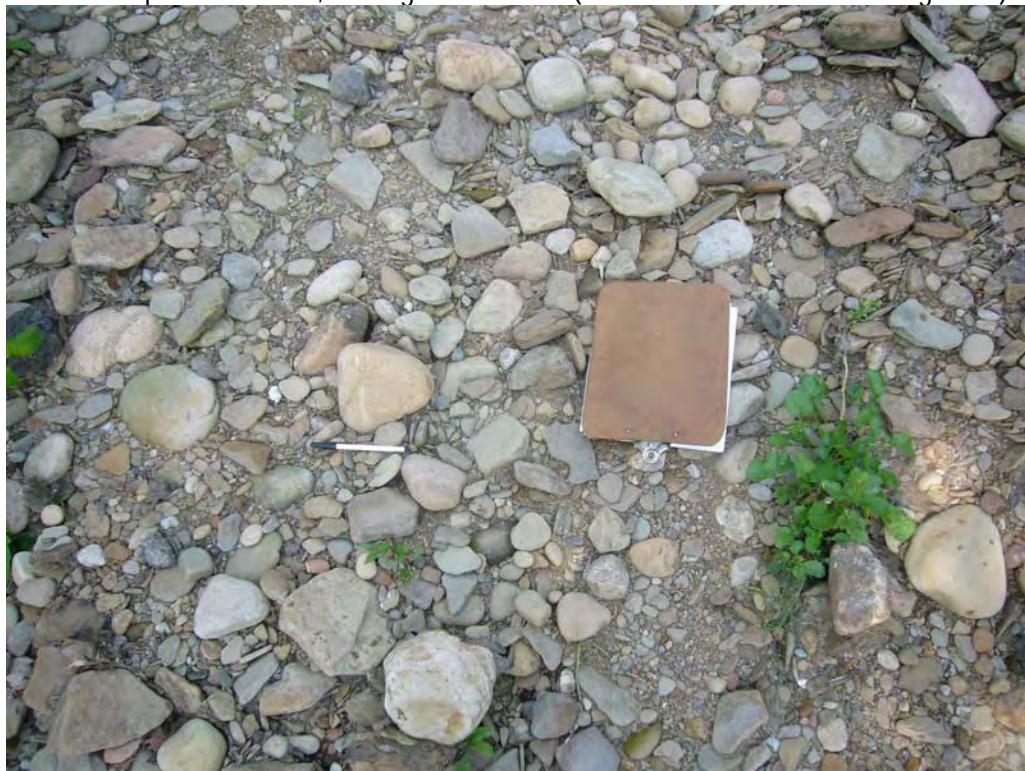
Channel upstream of site, looking downstream



Channel upstream of site, looking downstream



Channel upstream of site, looking downstream (Eroded Embankment in background)



Typical channel substrate



Failed security fence on terrace, upstream side



Failed security fence on terrace, upstream side



Terrace (abandoned floodplain) upstream of site



Eroded terrace slope downstream of site, (downstream end of failed security fence)



Eroded embankment



Eroded embankment, looking upstream



Channel undercutting Rock layer, downstream of site.



Security Fence adjacent to channel, downstream of site, looking downstream



Channel downstream of site



Terrace (abandoned floodplain) downstream of site



Typical soils in eroded embankment

Attachment E

Survey Computations

Survey Computations: Beaver Valley East Landfill

Survey Date: June 25, 2008

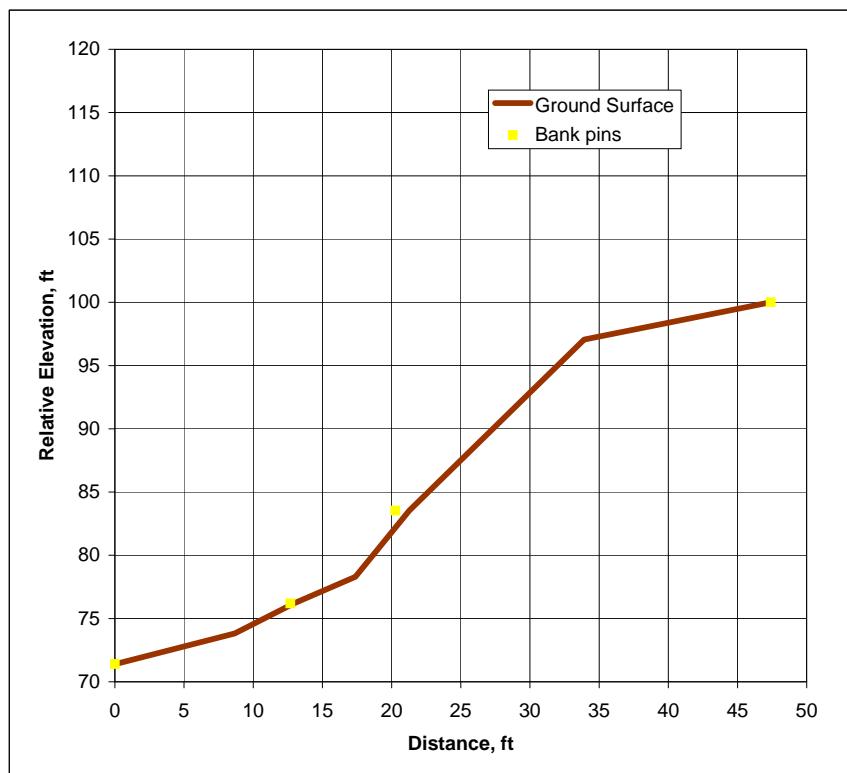
Field Crew: Cheri Salas, Lindsey Carr

Field X (on angle)	Field Y	Notes	Delta X	Delta Y	Adjusted Delta X	Adjusted X	Elevation	Slope	H:1
0.0	24.18	Toe Pin			0.0	0.0	71.41		
0.0	24.2		0.0	-0.02	0.0	0.0	71.39		
9.0	21.77		9.0	2.43	8.7	8.7	73.82	28%	3.57
13.8	19.39	Bank Pin 1 (extrudes 0.25 ft)	13.8	4.81	12.9	12.9	76.20	56%	1.79
18.7	17.29		18.7	6.91	17.4	17.4	78.30	47%	2.12
24.5	12.05	Bank Pin 2 (extrudes 1.0ft)	24.5	12.15	21.3	21.3	83.54	134%	0.74
43.0	7.79	Top of Bank	18.5	13.51	12.6	33.9	97.05	107%	0.94
56.8	4.84	Survey Control (17' from Maple Cluster, 33.3' from Apple)	13.8	2.95	13.5	47.4	100.00	22%	4.57

Survey Control

Bank Pin 1 (extrudes 0.25 ft)	12.7	76.20
Bank Pin 2 (extrudes 1.0ft)	20.3	83.54
Toe Pin	0.0	71.41
Survey Control (17' from Maple Cluster, 33.3' from Apple)	47.4	100.00

	Instrument Height	Turning Point
Set-up 1	95.59	5.47
Set-up 2	104.84	14.72



Attachment F Soils Analysis Results

Report Number:
R08196-0053

Account Number:
77596

A&L Eastern Laboratories, Inc.

7621 Whitepine Road Richmond, Virginia 23237 (804) 743-9401
Fax No. (804)271-6446 Email: office@al-labs-eastern.com



Send To: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

Submitted By: CHERI SALAS

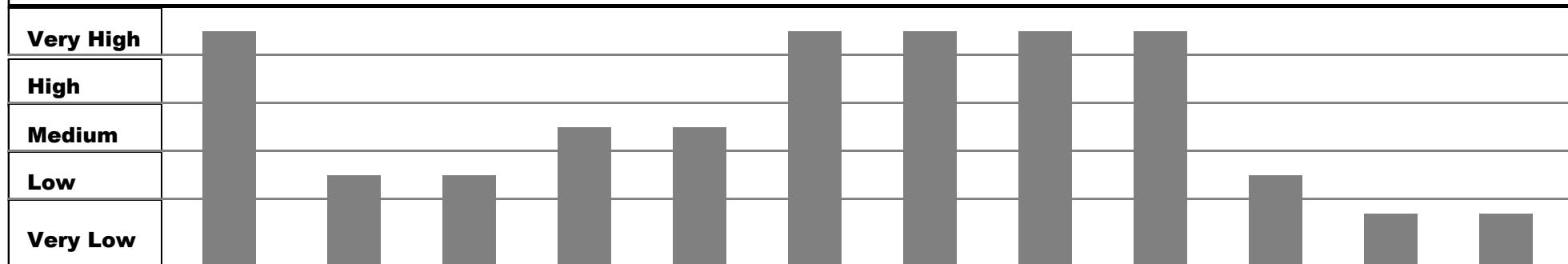
Sample Number: LYN-FOR

Lab Number: 1979

Date Received: 7/14/2008

Date Reported: 7/16/2008

GRAPHIC SOIL ANALYSIS REPORT



TEST RESULTS	P	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B	Na	Soluble Salts
	Phosphorus	Potassium	Magnesium	Calcium	Sulfur	Zinc	Manganese	Iron	Copper	Boron	Sodium	
ppm	155	52	80	960	21	999.0	80	57	18.8	0.5	14	109

pH	ACIDITY	C.E.C.	PERCENT BASE SATURATION					ORGANIC MATTER	NITRATE	CHLORIDE	Aluminum		ENR
Soil pH	H meq/100g	meq/100g	K %	Mg %	Ca %	Na %	H %	%	NO3-N ppm	Cl ppm	Al ppm		lbs/A
5.6	1.7	7.4	1.8	9.0	65.0	0.8	23.3	8.8					150

Report Number:

R08196-0053

Account Number:

77596

A&L EASTERN LABORATORIES, INC.

7621 Whitepine Road • Richmond, Virginia 23237
(804) 743-9401 • Fax No. (804) 271-6446



Send To: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

Submitted By: CHERI SALAS

Sample Number: LYN-BNK

Lab Number: 1980

Date Received: 7/14/2008

Date Reported: 7/16/2008

Comments:

Sample LYN-BNK: For more in depth explanation, go to our website www.al-labs-eastern.com and select the "Lawn and Garden" tab at the top of home page. At the bottom of the "Lawn and Garden" page, you find information explaining a soil test report and fertilizer recommendations.
<http://al-labs-eastern.com/forms/LawnGardenSoilTestExplained.pdf>

Sample LYN-BNK: Apply the amount of lime recommended in first page to raise pH

Sample LYN-BNK: Apply dolomitic lime to raise pH and improve the magnesium level.

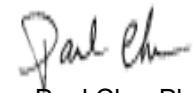
Sample LYN-BNK: For best result, if there are no existing plants, broadcast all lime then till and mix 6 inches into the soil. Limit the lime application to 50 pounds per 1000 sq. ft. for existing plants, apply every 4-6 months until the recommended amount is fulfilled.

Sample LYN-BNK: Phosphate is more efficient if applied near the plant, apply all phosphate beside the row. Broadcast N and/or K₂O then mix into the soil. If there is no fertilizer meets the ratio, you can use single element fertilizer such as Urea, Triplesuper Phosphate and Muriate of Potash to achieve the requirements. Consult the enclosed instruction sheet on lime and fertilizer application.

Sample LYN-BNK: All recommended fertilizers are on actual elemental basis. To convert to product basis, divide the recommended quantity in the first page by the percentage of the active ingredient then multiply by 100.

Sample LYN-BNK: Use Ammonium Sulfate as N source to supply sulfur.

Sample LYN-BNK: Broadcast boron using Borax and mix into the soil to raise boron level. Note boron should not be applied in the band near the plant.



Paul Chu, Ph.D.

Report Number:
R08196-0053

Account Number:
77596

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7621 Whitepine Road • Richmond, Virginia 23237
(804) 743-9401 • Fax No. (804) 271-6446



Send To: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

Submitted By: CHERI SALAS

Sample Number: LYN-FOR

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Comments:

Sample LYN-FOR: For more in depth explanation, go to our website www.al-labs-eastern.com and select the "Lawn and Garden" tab at the top of home page. At the bottom of the "Lawn and Garden" page, you find information explaining a soil test report and fertilizer recommendations.
<http://al-labs-eastern.com/forms/LawnGardenSoilTestExplained.pdf>

Sample LYN-FOR: Apply the amount of lime recommended in first page to raise pH

Sample LYN-FOR: Apply dolomitic lime to raise pH and improve the magnesium level.

Sample LYN-FOR: For best result, if there are no existing plants, broadcast all lime then till and mix 6 inches into the soil. Limit the lime application to 50 pounds per 1000 sq. ft. for existing plants, apply every 4-6 months until the recommended amount is fulfilled.

Sample LYN-FOR: All recommended fertilizers are on actual elemental basis. To convert to product basis, divide the recommended quantity in the first page by the percentage of the active ingredient then multiply by 100.

Sample LYN-FOR: Use Ammonium Sulfate as N source to supply sulfur.

Paul Chu, Ph.D.

Report Number:
R08196-0053

Account Number:
77596

A&L Eastern Laboratories, Inc.

7621 Whitepine Road Richmond, Virginia 23237 (804) 743-9401
Fax No. (804)271-6446 Email: office@al-labs-eastern.com



Send To: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

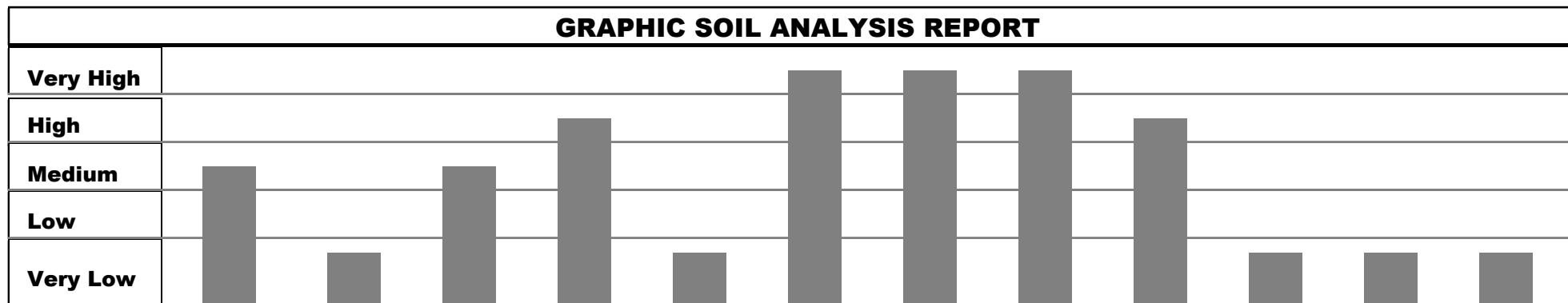
Submitted By: CHERI SALAS

Sample Number: LYN-BNK

Lab Number: 1980

Date Received: 7/14/2008

Date Reported: 7/16/2008



TEST RESULTS	P	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B	Na	Soluble Salts
	Phosphorus	Potassium	Magnesium	Calcium	Sulfur	Zinc	Manganese	Iron	Copper	Boron	Sodium	
ppm	34	33	70	630	9	199.0	81	139	2.6	0.1	11	51

pH	ACIDITY	C.E.C.	PERCENT BASE SATURATION				ORGANIC MATTER	NITRATE	CHLORIDE	Aluminum		ENR	
Soil pH	H meq/100g	meq/100g	K %	Mg %	Ca %	Na %	H %	%	NO ₃ -N ppm	Cl ppm	Al ppm		lbs/A
6.1	0.6	4.5	1.9	13.0	70.3	1.1	13.7	1.1					66

Report Number:
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HERNDON, VA 20171

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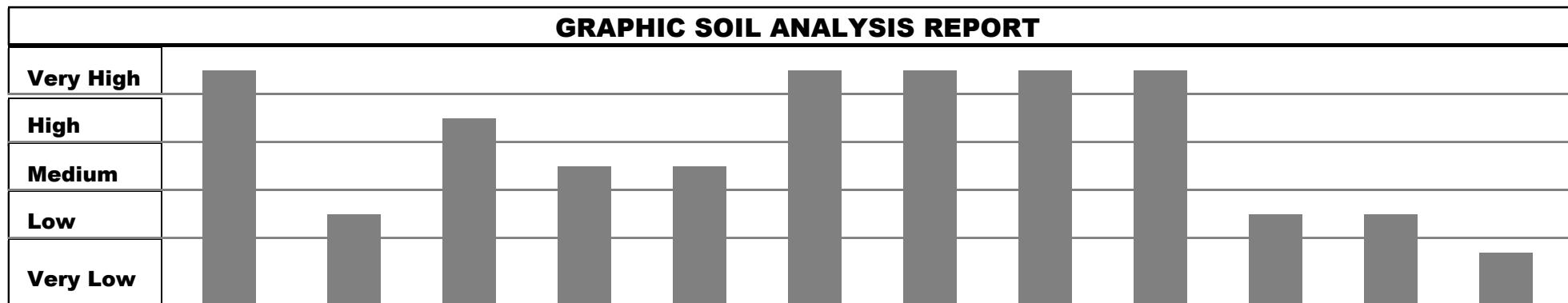
Submitted By: CHERI SALAS

Sample Number: LYN-SITE

Lab Number: 1981

Date Received: 7/14/2008

Date Reported: 7/16/2008



TEST RESULTS	P	K	Mg	Ca	S	Zn	Mn	Fe	Cu	B	Na	Soluble Salts
	Phosphorus	Potassium	Magnesium	Calcium	Sulfur	Zinc	Manganese	Iron	Copper	Boron	Sodium	
ppm	107	90	80	550	18	999.0	82	53	18.3	0.4	21	102

pH	ACIDITY	C.E.C.	PERCENT BASE SATURATION					ORGANIC MATTER	NITRATE	CHLORIDE	Aluminum		ENR
Soil pH	H meq/100g	meq/100g	K %	Mg %	Ca %	Na %	H %	%	NO3-N ppm	Cl ppm	Al ppm		lbs/A
6.0	0.7	4.4	5.2	15.1	62.2	2.1	15.4	6.3					150

Report Number:
R08196-0053

Account Number:
77596

A&L EASTERN LABORATORIES, INC.

7621 Whitepine Road • Richmond, Virginia 23237
(804) 743-9401 • Fax No. (804) 271-6446



Send To: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

Submitted By: CHERI SALAS

Sample Number: LYN-SITE

Lab Number: 1981

Date Received: 7/14/2008

Date Reported: 7/16/2008

Comments:

Sample LYN-SITE: For more in depth explanation, go to our website www.al-labs-eastern.com and select the "Lawn and Garden" tab at the top of home page. At the bottom of the "Lawn and Garden" page, you find information explaining a soil test report and fertilizer recommendations.
<http://al-labs-eastern.com/forms/LawnGardenSoilTestExplained.pdf>

Sample LYN-SITE: Apply the amount of lime recommended in first page to raise pH

Sample LYN-SITE: For best result, if there are no existing plants, broadcast all lime then till and mix 6 inches into the soil. Limit the lime application to 50 pounds per 1000 sq. ft. for existing plants, apply every 4-6 months until the recommended amount is fulfilled.

Sample LYN-SITE: All recommended fertilizers are on actual elemental basis. To convert to product basis, divide the recommended quantity in the first page by the percentage of the active ingredient then multiply by 100.

Sample LYN-SITE: Use Ammonium Sulfate as N source to supply sulfur.

Sample LYN-SITE: Broadcast boron using Borax and mix into the soil to raise boron level. Note boron should not be applied in the band near the plant.



Paul Chu, Ph.D.

Report Number:

R08196-0053

Account Number:

77596

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Fax No. (804) 271-6446 Email: office@al-labs-eastern.com

TO: CH2M HILL
13921 PARK CENTER RD
SUITE 600
HERNDON, VA 20171

Grower: PROJ#365166.P1.T1

Submitted By: CHERI SALAS

ATTN: TARA AJELLO

Date Received: 7/14/08 Date Reported: 07/22/2008

REPORT OF ANALYSIS

Page: 1

LAB NO.	SAMPLE ID	ANALYSIS	RESULT	UNIT	METHOD
1979	LYN-FOR	Retained on U.S. #10 Sieve Sand Silt Clay Soil Textural Class	49.62 60 28 12 Sandy Loam	% % % % Bouyoucos 1962	ASTM D422-63 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962
1980	LYN-BNK	Retained on U.S. #10 Sieve Sand Silt Clay Soil Textural Class	50.92 92 4 4 Sand	% % % % Bouyoucos 1962	ASTM D422-63 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962
1981	LYN-SITE	Retained on U.S. #10 Sieve Sand Silt Clay Soil Textural Class	36.70 64 26 10 Sandy Loam	% % % % Bouyoucos 1962	ASTM D422-63 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962 Bouyoucos 1962

ALE-MISC

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A handwritten signature in black ink that reads "Paul Chu".

Paul Chu, Ph.D.

Attachment G

Cost Estimation Details

Opinion of Construction Cost					
PROJECT : Security Fence					ESTIMATOR: Augustus Kodua
FACILITY : LyondellBasell Beaver Valley East Landfill					PROJ. MGR: Cheri Salas
LOCATION: Monaca, PA					PROJ.NO.:
EST DATE: July 30, 2008					

RFP DESCRIPTION

Chainlink Fence 400 LF

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT \$	AMOUNT
1.0.	Remove existing fence and haul away	LF	200	\$6.50	\$1,300
2.0.	Chainlink Fence, 3 strand barbed wire, 8' high, galv.	LF	400	\$25.00	\$10,000
3.0.	Misc work including clearing and grubbing along new fence alignment	LS	1	\$3,500.00	\$3,500
SUBTOTAL					\$14,800
General Contractor O&P			35%		\$5,180
TOTAL ESTIMATED CONSTRUCTION COST					\$19,980
Cost Range (OM Estimate +50%/-30%)				\$13,986	\$29,970
<i>Template Originated by CH2M Hill CMS Group</i>					

Note: Estimate based on RS Means 2008